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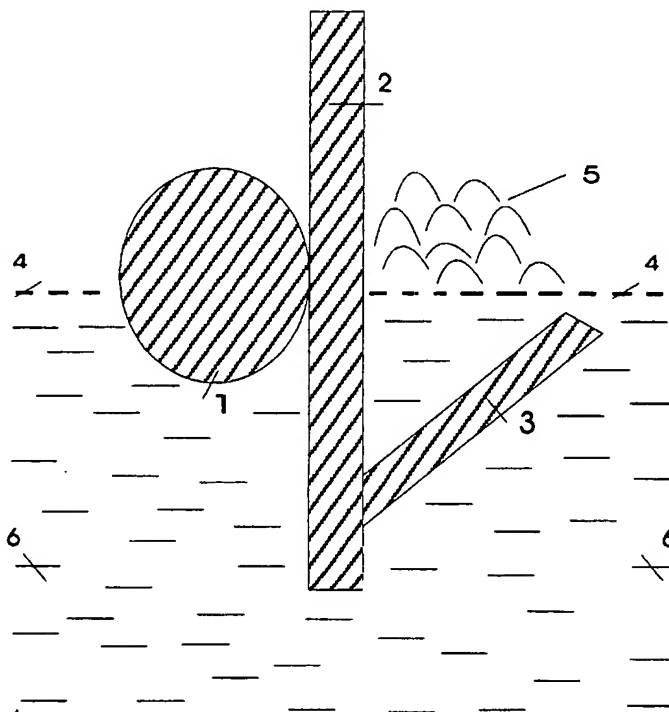
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(54) Title: A METHOD OF INDUCTION OF WATER STREAMS SELF-PURIFICATION



(57) Abrégé/Abstract:

A method of water streams instantaneous clean-up from pollutants used for drinking, technical or any other specific water preparation directly at a site is proposed. The process is based on the natural ability of water streams to self-purification and utilizes water stream turbulence and resulting air bubbles formation and comprises pollutants flotation directly from the stream, further froth collection by a froth entrapping element and polluting agents removal or movement with the froth with further precipitation at designated locations.

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ABSTRACT

A method of water streams instantaneous clean-up from pollutants used for drinking, technical or any other specific water preparation directly at a site is proposed. The process is based on the natural ability of water streams to self-purification and utilizes water stream turbulence and resulting air bubbles formation and comprises pollutants flotation directly from the stream, further froth collection by a froth entrapping element and polluting agents removal or movement with the froth with further precipitation at designated locations.

A METHOD OF WATER STREAMS SELF-PURIFICATION

The present invention relates to water treatment for preparation of drinking, technical or other water by water streams clean-up from pollutants directly at the site. Water streams mean any creeks, rivers, springs or raw water transported by channel or pipe for treatment.

Flotational separation techniques, especially the techniques such as those in U.S. Pat. No. 5,306,422 dated Apr., 1994 and U.S. Pat. No. 5,538,631 dated Jul., 1996 allow to treat the waste water.

10 In the patent, U.S. Pat. No. 4,690,756, dated Sept.1, 1987, an apparatus for a flotational removal of pollutants, nutrients, toxins from natural bodies of water and wastewater in situ is proposed. A gas is introduced through a diffuser into a body of water to form bubbles.

In the patent, U.S. Pat. No. 5,122,165, dated Jun., 1992, a process and apparatus for removal of toxic volatile compounds and surfactants from a contaminated liquid stream is described. This process system involves liquid pumping; gas purification by a foam collector; etc.

In the patent U.S. Pat. No. 5,482,620 dated Jan.9, 1996, a permeable ditch underwater water purification apparatus purifies source water using a granular filter layer. This apparatus includes impermeable ditch walls on a tapered bottom.

20 In nature running water is often mixed with air, froth on the water surface is abundant especially after some obstacles present at the stream bed, that causes the turbulence. These elements are also characteristic to flotational process and the basic idea of proposed invention is to utilize naturally occurring flotational process of pollutants or to enhance this flotational process by adding surfactants, providing changes in water speed and character of flow, etc. Froth collection and possible removal or movement to designated locations are thus the next step in a clean-up process.

30 For performing flotational processes, this method uses flotational agents that are either already present into the water as a result of industrial or naturally occurring biological activities or flotational agents are added to the water. Air is taken into the water stream and is released forming further air bubbles because of naturally occurring changes in water speed along the water stream. To promote a formation of air bubbles into running water artificial changes in water speed could be arranged.

To collect flotational froth, one, two or any necessary number of froth collectors are installed on the top of the water stream along water current, at one or several

sites where froth is collected. Froth collectors is any object installed at the water stream or floating there, the said froth collectors entrap all or part of the froth from the water. The froth collector may be constructed and placed in a way that allows the froth to be concentrated at the selected sites.

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The froth further could be removed from the said froth collector, it could be pumped to froth collecting tanks, ponds or treatment plant.

In order to avoid the release of the aggregates of contaminating particles from the froth into water, the construction of the froth trap could include an element that would entrap the said aggregates, the said precipitates composing contaminants could be further removed or treated.

50 It could also be that the construction and installation of the flotational trap with or without the said precipitate entrapping element enables the froth to be moved to certain sites of concentration by surface water movement, for example, to the bank or banks of the water stream. If the velocity of water at such sites is low or only the surface layer is moving at all after decay of air bubbles contaminating aggregates would be accumulated at the bottom of such sites. It could also be that at such sites there would be an opening in the flotational trap allowing the froth to be moved downstream with the movement of surface water. In a case if this water slowly movement takes place along properly designed channel, the aggregates would precipitate to the bottom of the said shallow channel and could be further removed. The said channel could have specially designed elements at the bottom (like ribs)
60 that favors precipitation. The said channel should end downstream releasing surface water and surfactants into the main body of water.

“ In drawings which illustrate an example of the embodiments of the invention, Figure 1 is a section of a froth collector are represented, where:

- 1 is a floating element;
- 2 is a screen;
- 3 is a precipitate entrapping element;
- 4 is surface water;
- 5 is froth;
- 6 is water.

“ In drawings which illustrate an example of the embodiments of the invention, Figure 2 is a top view that presents the mechanism of contaminants removal to precipitate, where:

- 1 is a bank of water stream;
- 2 is a direction of water movement;
- 3 is a direction of froth and surface water movement;
- 4 is a froth collector;
- 5 is a channel or pipe for further movement of surface water;
- 6 is water.

“ In drawings which illustrate an example of the embodiments of the invention, Figure 3 is a section of a channel 5 that illustrate the mechanism of precipitates accumulation by the channel, where:

- 1 is froth;
- 2 are ribs at the bottom;
- 3 is an accumulated precipitate;
- 4 is a direction of froth and surface water movement;
- 5 is a channel.

A METHOD OF WATER STREAMS SELF-PURIFICATION

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of induction of water streams self-purification from pollutants for drinking, technical or any other specific water preparation, water streams hereinafter mean creeks, rivers, springs, streams or raw water transported by channel or pipe for further treatment, the said method utilizes:
turbulent or shallow turbulent character of water current an certain site, the said turbulence or shallow turbulence occurs as a result of naturally occurring or artificially created reasons, for example, but not limited by this example, a rocky ramp is build at the water stream bed,
the said turbulence or shallow turbulence results in the formation of air bubbles, the polluting particles are floated by the said air bubbles,
the formed froth is collected by froth collector or collectors positioned downstream from the site of floatation,
the said froth collector means any object or objects that collects or collect froth at least for some time, for example, but not limited by this example, a anchored tree log in the water, the said tree log does or does not protrude from one bank to another.
2. A method of water clean up as it is claimed in Claim 1, which utilizes flotational agents that are already present in the water as a result of industrial or naturally occurring biological activities or of any other reasons, or the said flotational agents are added to the water to promote the flotational processes.
3. A method of water clean up as it is claimed in Claim 1, wherein one, two or any necessary number of froth collectors are installed on the top of the same water stream at different sites.
4. A froth collector, as it is claimed in Claim 3, wherein the said froth collectors protrudes from one bank of the stream to the other of the said stream, thus making it impossible for the froth to by-pass the said froth collector or the said froth collectors intercept only part of the current and part of the froth.
5. A method of utilization of the froth collectors as it is claimed in Claim 4, wherein the said froth is moved or pumped from said collectors to froth collection tanks, ponds or treatment plant.
6. A construction of froth collector as it is claimed in Claim 1, wherein the said froth collector includes an element that entraps particles of contaminants that precipitate from the froth, for example, but not limited by this example, a construction of the said

froth collector as it is shown in Fig. 1,
 in such a way the said entrapped precipitate of contaminating particles can be further removed from the said element by water movement or by any other way to the desired destination of accumulation for consequent treatment or disposal or the said precipitate could be treated directly at the said element,
 for example, but not limited by this example, the said precipitate could be treated microbiologically directly at the site.

7. A construction of froth collector as it is claimed in Claim 1, wherein the said froth collector does not allow the froth to bypass the said froth collector either from above or below, for example, but not limited by this example, a construction of the said froth collector that includes a screen, as it is shown in Fig. 1.
8. A froth collector as it is claimed in Claim 3 and Claim 4, wherein the said froth collector is constructed and placed in the water in a way that the froth is moved by surface water current to the selected sites of the said froth collector, for example, but not limited by this example the said froth collector is placed on the surface of water stream forming an angle of less than 90° with the said water stream direction, thus the froth to be moved along the said froth collector to the designated location wherein the said froth could be concentrated.
9. A froth collector as it is claimed in Claim 1 and a method of the said froth collector installation at the water stream as it is claimed in Claim 8,
 wherein the released from the said froth contaminating aggregates of particles precipitate directly at the said site of concentration to the bottom or the said site or the said aggregates are taken by water movement to the desired location of accumulation at the bottom,
 for example, but not limited by this example, a construction of a froth collector installed on the top of a water stream as it is shown in Fig. 2 and Fig. 3, wherein the said froth collector has an opening in it, the said opening leads to a special channel or pipe located downstream from the said froth collector, another end of the said channel or pipe is opened into the water stream downstream from the said collector, contaminating particles precipitate to the bottom of the said channel or pipe and there are special elements at the bed of the said channel or pipe to promote an accumulation of the said contaminants.

Fig.1.

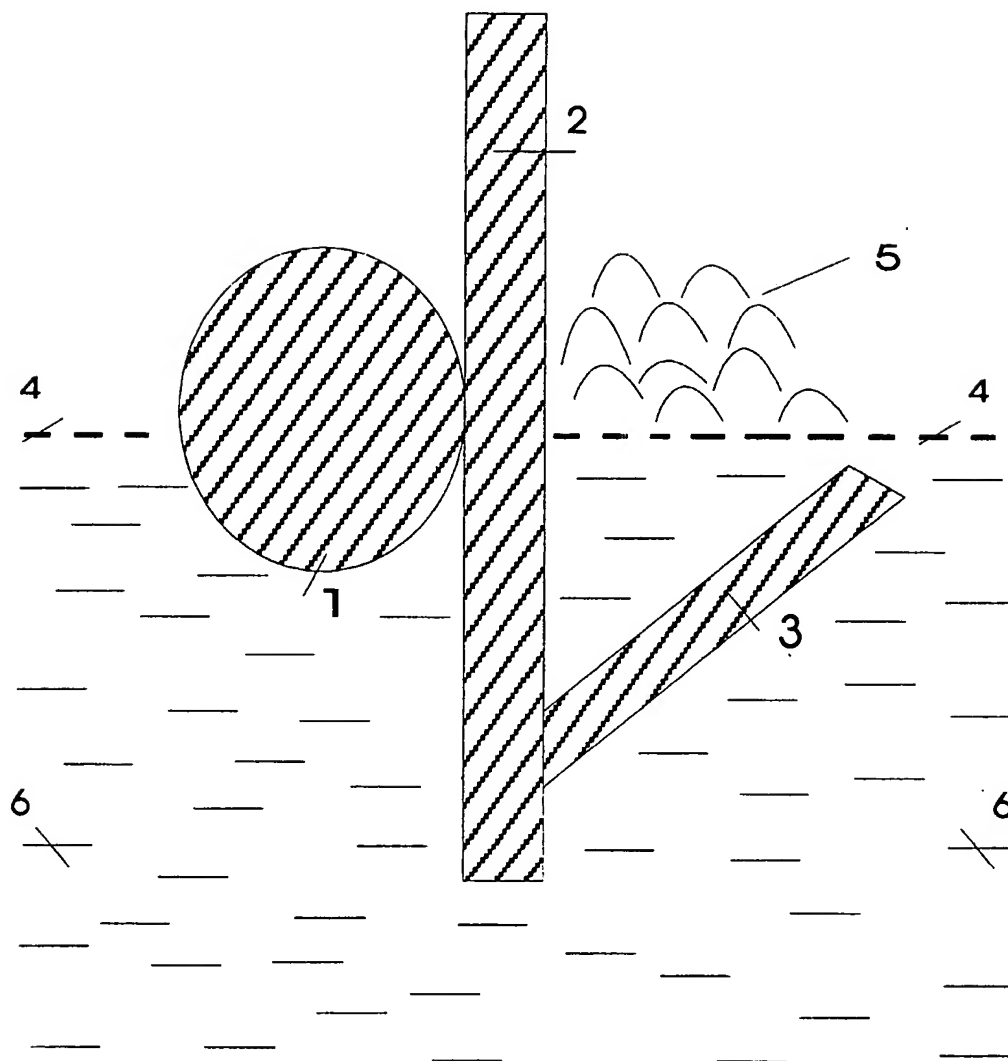


Fig 2.

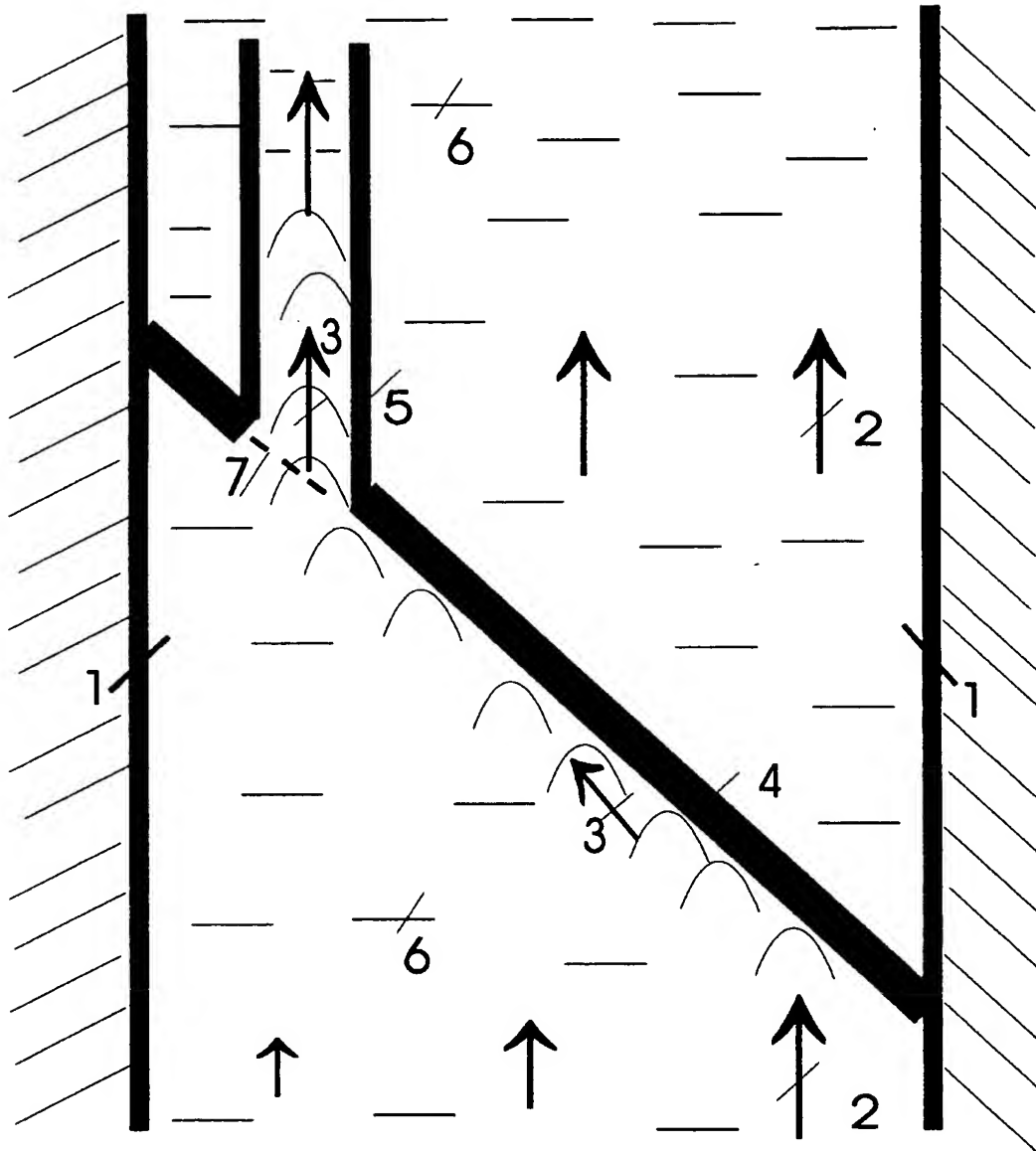


Fig 3.

